

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.			
1. AGENCY USE ONLY (Leave Blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED	
	September 1997	Final Technical Report, 6/1/97 - 9/30/97	
4. TITLE AND SUBTITLE <i>Asymptotic Description of Ultrashort Pulse Propagation in Complex Dispersive Media</i>		5. FUNDING NUMBERS  <i>AFOSR Grant # F49620-97-1-0300</i>	
6. AUTHORS  <i>Kurt Edmund Oughstun</i>			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <i>College of Engineering &amp; Mathematics The University of Vermont Burlington, Vermont 05405-0156</i>		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) <i>Dr. Arje Nachman AFOSR, NM 110 Duncan Avenue, Suite B115 Bolling Air Force Base, DC 20332-8050</i>		10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES			
12a. DISTRIBUTION / AVAILABILITY STATEMENT  <i>Approved for public release; distribution unlimited.</i>		12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  <i>A complete asymptotic description of ultrawideband/ultrashort electromagnetic pulse propagation in causally dispersive, attenuative media has been developed and will be extended to complex dielectric, conducting, and magnetic media exhibiting temporal dispersion.</i>			
14. SUBJECT TERMS		15. NUMBER OF PAGES	
		16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

1997/203/231

## Final Technical Report

(due September 1997)

### Asymptotic Description of Ultrashort Pulse Propagation in Complex Dispersive Media

AFOSR Grant # F49620-97-1-0300

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Our long-term research goal is to develop a rigorous analytic formulation and, based upon this, a uniform asymptotic description of pulsed electromagnetic beam-field propagation, reflection, and transmission phenomena in causally dispersive dielectric and conducting media. Emphasis has been placed first on a formulation that has been rigorously obtained from the macroscopic Maxwell's equations with physically appropriate constitutive relations, followed by the development and application of the required uniform asymptotic expansion techniques that are necessary to provide a completely continuous description of the space-time evolution of the pulsed beam-field at sufficiently large propagation distances from the input plane. A detailed description of the most recent results of this research have been presented in the invited paper on "Transient Field Properties of Ultrawideband Pulse Propagation in Complex Dispersive Media," at the 1997 Progress in Electromagnetics Research Symposium (PIERS) in Cambridge, Massachusetts. A portion of this research resulted in the following publications (reprints attached if available):

K. E. Oughstun, "Nonlinear Optical Pulse Propagation in the Single-Cycle Regime: Comments," *Physical Review Letters* (submitted).

H. Xiao and K. E. Oughstun, "Hybrid Numerical-Asymptotic Code for Dispersive Pulse Propagation Calculations," *Journal of the Optical Society of America A* (submitted).